

## TAP 514- 2: Half Life

The half-life of strontium-90 is 27 years. The half-life of sodium-24 is 15 hours.

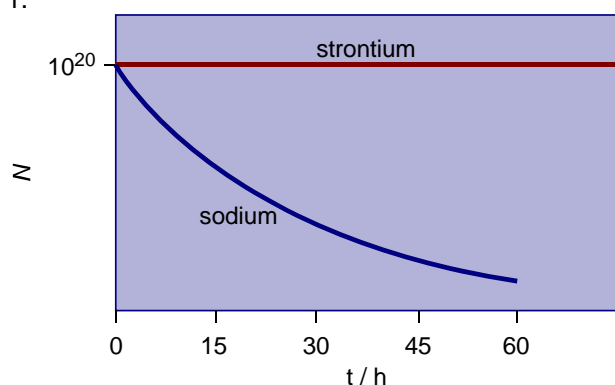
1. Sketch two curves on one set of axes to show how the number of atoms of each change with time.

Two samples are prepared, one containing  $10^{20}$  atoms of strontium and the other containing  $10^{20}$  atoms of sodium.

2. Which of the two samples has the highest activity?
3. A sample of iodine-131, with half-life 8.04 days, has an activity of  $7.4 \times 10^7$  becquerel. Calculate the activity of the sample after 4 weeks?
4.  $^{234}\text{Th}$  has a half life of 24.1 days.
  - (a) What fraction of a sample remains after 96.4 days?
  - (b) What fraction of a sample remains after 241 days?

## Answers and worked solutions

1.



2. Sodium, since a longer half-life means the source is less active.

3. First find the number of half-lives in 4 weeks:

$$\frac{4 \times 7 \text{ days}}{8.04 \text{ days}} = 3.48.$$

The activity will be:

$$\frac{7.4 \times 10^7 \text{ Bq}}{2^{3.48}} = 6.6 \times 10^6 \text{ Bq}.$$

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(a)  $96.4/24.1=4$  so 4 half lives so  $(1/2)^4 = 1/16$  or .0625

(b)  $241/24.1=10$  so 10 half lives  $(1/2)^{10} = 1/1024$  or  $9.8 \times 10^{-4}$

## External references

This activity is taken from Advancing Physics chapter 10, 20S which was an adaptation of Revised Nuffield Advanced Physics question 15 section F.